Improvements in and relating to resilient mountings for machinery, instruments and the like

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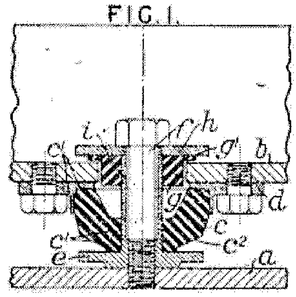
- European: F16F1/371B
Application number: GB19440015970 19440821
Priority number(s): GB19440015970 19440821

Abstract of **GB 586608 (A)**

586,608. Resilient mountings. NORMAN, J. W. LA F., and WRIGHT, C. S. Aug. 21, 1944, No. 15970. [Class 108 (iii)] A resilient mounting for machinery, instruments &c. comprises a weight-supporting part consisting of a substantially frusto-conical annular or recessed rubber or like, block c having main bearing surfaces c<1> arranged out of alignment axially and transversely and a secondary bearing surface c<2> adapted to bear against a supporting surface e under loads greater than normal, the surface c<2> being in the form of a sharplydefined frusto-conical portion of the outer surface of the block c adjacent the smaller end thereof and of greater divergence than the remainder of the outer surface. As shown, a machine b is supported on a base a by the block c, the bearing surfaces c<1> of which are bonded to a flanged metal frame d and to a centrallyspigoted bearing plate e through which extends a securing bolt f. A flanged rubber shock ring g, which may have a retaining plate h, may be mounted on a sleeve i abutting the spigot-of the plate e. The block c is stressed mainly in shear by axial load until the surface c<2> encounters the bearing plate e when the rubber is stressed in compression. Under normal axial load the spigot of the plate e enters the central aperture of the frame d so that the block resists heavy lateral loads by compression as well as shear. Lateral shock loads are also resisted by the rubber ring g which is compressed when it encounters the surrounding wall of the hole -in the machine b or base a, and the flange g<1> of the ring is compressed by axial loads in a direction opposite to that of the normal load.

FIG. I.



PATENT SPECIFICATION

586,608

Application Date: Aug. 21, 1944. No. 15970/44.

Complete Specification Accepted: March 25, 1947.

COMPLETE SPECIFICATION

Improvements in and relating to Resilient Mountings for Machinery, Instruments and the like

ERRATA

SPECIFICATION No. 586,608.

Page 1, line 31, *for* " frusto-coated " *read* " frusto-conical "
Page 1, line 59, *for* " variation " *read* " vibration "

THE PATENT OFFICE.
1*st September*, 1947.

... block of resilient material such as rubber with main bearing surfaces arranged out of alignment axially and transversely and a secondary bearing surface to bear against a supporting surface under loads greater than normal loads, and according to the invention the secondary bearing surface is in the form of a sharply defined frusto-coated portion of the outer surface of the resilient block adjacent the smaller end thereof and of greater divergence than the remainder of the outer surface.

The invention should be distinguished from previous proposals for resilient mountings in which the resilient part is built up from a co-axial series of frusto-conical rings with interposed co-axial metal rings which progressively encounter a supporting surface under increasing load or in which the resilient part is a single block of rubber of substantially frusto-conical or domed shape having a curved outer surface which encounters a supporting surface under increasing load. In the mounting according to the present invention the sharp definition between the secondary bearing surface and the remainder of the resilient block promotes a combination of bending and shear, like a knee action, about the junction of the above-mentioned secondary bearing surface, the mounting may have another resilient part which has a bearing surface spaced from an opposed supporting surface against which it abuts and is compressed only on heavy or shock load.

The invention as applied to machine mountings made of metal and rubber is illustrated by way of example in the accompanying drawings, in which:—

Figure 1 is a sectional elevation on the line I—I of Figure 2 of a resilient mounting supporting a machine on a bed-plate.

Figure 2 is a plan view of the mounting shown in Figure 1.

Figures 3 and 4 are sectional elevations of alternative arrangements of machine mountings, the arrows indicating the direction of the static load.

Figures 5 and 6 are perspective views of the resilient rubber block alone.

Figures 7, 8 and 9 are diagrammatic sectional elevations of a mounting showing load effects.

Figure 10 is a typical load deflection curve for mountings such as those shown in the drawings.

In all the accompanying drawings, like reference letters indicate like or equivalent parts.

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Improvements in and relating to Resilient Mountings for Machinery, Instruments and the like

We, JAMES WILLIAM LA FRENCH NORMAN, of Admiralty Research Laboratory, Teddington, Middlesex, and CHARLES SEYMOUR WRIGHT, C.B., O.B.E., M.C., M.A., Director of Scientific Research, of Admiralty, London, S.W.1, both of British Nationality, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to resilient mountings for machinery, instruments and the like and its object is to provide an efficient sound-insulating and shock-absorbing mounting of simple and robust construction.

The invention is applied to resilient mountings of a known kind having a weight-supporting part consisting of a substantially frusto-conical annular or recessed block of resilient material such as rubber with main bearing surfaces arranged out of alignment axially and transversely and a secondary bearing surface to bear against a supporting surface under loads greater than normal loads, and according to the invention the secondary bearing surface is in the form of a sharply defined frusto-coated portion of the outer surface of the resilient block adjacent the smaller end thereof and of greater divergence than the remainder of the outer surface.

The invention should be distinguished from previous proposals for resilient mountings in which the resilient part is built up from a co-axial series of frusto-conical rings with interposed co-axial metal rings which progressively encounter a supporting surface under increasing load or in which the resilient part is a single block of rubber of substantially frusto-conical or domed shape having a curved outer surface which encounters a supporting surface under increasing load. In the mounting according to the present invention the sharp definition between the secondary bearing surface and the remainder of the resilient block promotes a combination of bending and shear, like a knee action, about the junction of the secondary bearing surface and the remainder of the block. This knee action ensures that under normal loads small variations of load produce relatively large deflections of the block thus absorbing variation.

The arrangement of the main bearing surfaces out of alignment results in the block being stressed mainly in shear under normal loads but as the load increases the secondary bearing surface progressively encounters a supporting surface so that the rate of deflection of the material of the block decreases as the block becomes stressed in compression and under shock load the secondary bearing surface rapidly encounters its supporting surface so that shock loads are taken mainly by compression of the block.

To meet heavy or shock loads in directions other than those provided for by the above-mentioned secondary bearing surface, the mounting may have another resilient part which has a bearing surface spaced from an opposed supporting surface against which it abuts and is compressed only on heavy or shock load.

The invention as applied to machine mountings made of metal and rubber is illustrated by way of example in the accompanying drawings, in which:—

Figure 1 is a sectional elevation on the line I—I of Figure 2 of a resilient mounting supporting a machine on a bed-plate.

Figure 2 is a plan view of the mounting shown in Figure 1.

Figures 3 and 4 are sectional elevations of alternative arrangements of machine mountings, the arrows indicating the direction of the static load.

Figures 5 and 6 are perspective views of the resilient rubber block alone.

Figures 7, 8 and 9 are diagrammatic sectional elevations of a mounting showing load effects.

Figure 10 is a typical load deflection curve for mountings such as those shown in the drawings.

In all the accompanying drawings, like reference letters indicate like or equivalent parts.

a is the bed-plate or base on which the machine b is supported by a dished frusto-conical rubber block c the bearing surfaces c^1 of which are bonded to a flanged metal frame d and a centrally spigotted bearing plate e through which extends a bolt f by which the mounting is secured between the base a and machine b.

A resilient rubber shock ring g with a retaining plate h is mounted on a sleeve i abutting against the spigot of the bearing plate e. The bolt f extending axially through the mounting holds the parts of the mounting in their assembled relationship without stressing any resilient part and also ensures that should the resilient parts be destroyed, such as by fire, the machine will not come adrift from its base.

Although the rubber and metal parts of the mounting may be bonded together at their contacting surfaces, these surfaces are not subject to shear and the mounting in no way relies on a metal to rubber bond.

As will be seen from the drawings, the bearing surfaces c^1 of the rubber block c although opposed axially and transversely are out of alignment so that initial loading of the block c from the state shown by Figure 7 to and about that shown by Figure 8 stresses the rubber mainly in shear.

Figure 10 shows a curve obtained by plotting against an increasing load applied to the mounting the deflection of the rubber block c measured in any convenient way, for example by the reduction of its length in the direction of the load. This curve shows that up to and about the normal load indicated by the broken line, small increases of load produce relatively large deflections so that the rubber block c by yielding readily to small load changes in this condition will absorb sound vibrations and prevent their transmission through the mounting. Above normal loads the rubber block c is placed in compression by its secondary bearing surface c^2 encountering the supporting surface of the plate e and the rate of deflection decreases rapidly so that the resilient block c provides stiff opposition in compression to heavy and shock loads.

The curve shown in Figure 10 may be compared with Figures 7, 8 and 9 which show three progressive stages of axial loading of the mounting. Figure 7 shows the unloaded condition and Figure 8 shows the normal loaded condition with the rubber block c stressed mainly in shear, with the material about the junction of the secondary bearing surface c^2 and the remainder of the block c free to move with a knee action consisting of a combination of bending and shear, whilst the surface c^2 is close to the opposed supporting surface of the bearing plate e ready to encounter it either progressively under a gradual but heavy increase of load or almost instantaneously under shock load. Figure 9 shows the block c in the condition of heavy or shock load with the block compressed axially between the bearing plate e and the opposed surface of the frame d.

Figure 8 also shows how under normal load the spigot of the bearing plate e has commenced to enter the central aperture of the frame d bringing the spigot and the flange of the frame d into radial alignment so that the block c can meet heavy lateral loads by compression as well as shear. In the heavy or shock load condition shown by Figure 9 a substantial part of the spigot of the bearing plate e is within the flange of the frame d.

In order to meet lateral shock loads arising when the block c is not under heavy axial load the rubber shock ring g is provided to encounter the surrounding wall of the hole in the machine b or the base a, as the case may be, and become compressed thereagainst. The shock ring g also has a radial flange g^1 backed up by the retaining plate h and spaced from the machine b or the base a which it encounters and becomes pressed against under axial shock loads in a direction opposite to that of the normal axial load.

By providing the block c with the sharply defined secondary bearing surface c^2 so as to give a knee action, and by proportioning its axial section as shown, the rubber block c has substantially equal stiffness for both axial and lateral variations of load at and about the normal load. Further by providing for the supporting surfaces of the frame d and bearing plate e to come into alignment under heavy or shock load and by providing the shock ring g, the mounting is made equally capable of meeting either or both axial and lateral heavy or shock loads. It will be noticed from the drawings that the central aperture of the frame d is relatively large and this permits the spigot of the bearing plate e in extreme cases to protrude axially beyond the frame d without encountering any fixed or rigid part of the mounting so that all loads are taken by the resilient parts of the mounting.

The use of the term rubber in this Specification means natural or synthetic rubber or resilient material with similar properties. Good results have been

achieved with soft varieties of natural rubber.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A resilient mounting for machinery, instruments or the like, having a weight-supporting part consisting of a substantially frusto-conical annular or recessed block of resilient material such as rubber with main bearing surfaces arranged out of alignment axially and transversely and a secondary bearing surface to bear against a supporting surface under loads greater than normal loads, in which the secondary bearing surface is in the form of a sharply defined frusto-conical portion of the outer surface of the resilient block adjacent the smaller end thereof and of greater divergence than the remainder of the outer surface.

2. A resilient mounting as claimed in Claim 1 in which the axial section of the resilient block is so proportioned that the block has substantially equal stiffness to both axial and lateral loads at and about the normal load.

3. A resilient mounting as claimed in Claim 1 or Claim 2 in which a second resilient part, such as a rubber ring, is provided with a bearing surface spaced from an opposed supporting surface against which it abuts and is compressed on heavy or shock loads.

4. A resilient mounting as claimed in Claim 3 in which the second resilient part has axial and radial bearing surfaces opposed to supporting surfaces against which they abut on lateral and axial shock loads respectively.

5. A resilient mounting for machinery, instruments or the like as described with reference to Figures 1 and 2.

6. A resilient mounting for machinery, instruments or the like as described with reference to Figure 3 or Figure 4.

7. A block of resilient material such as rubber for a resilient mounting as claimed in any of the foregoing claims as described and shown by Figures 5 and 6 of the accompanying drawings.

Dated this 18th day of August, 1944.

W. WESTON,
Chartered Patent Agent,
For the Applicants.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1947. Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies, price 1s. 0d. each (inland) 1s. 1d. (abroad) may be obtained.

Fig. 1

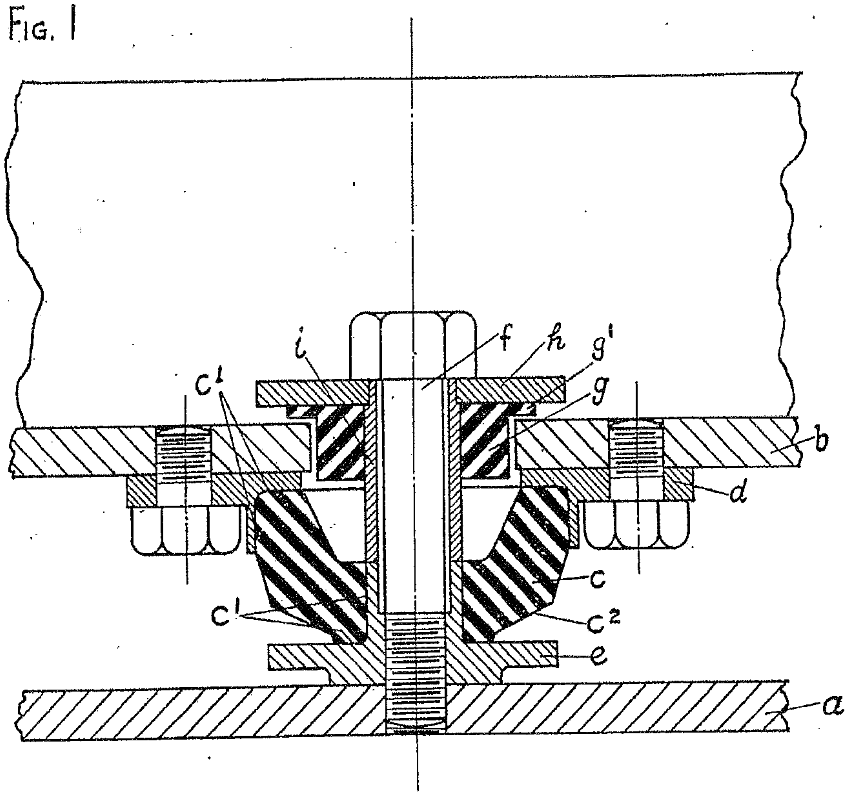
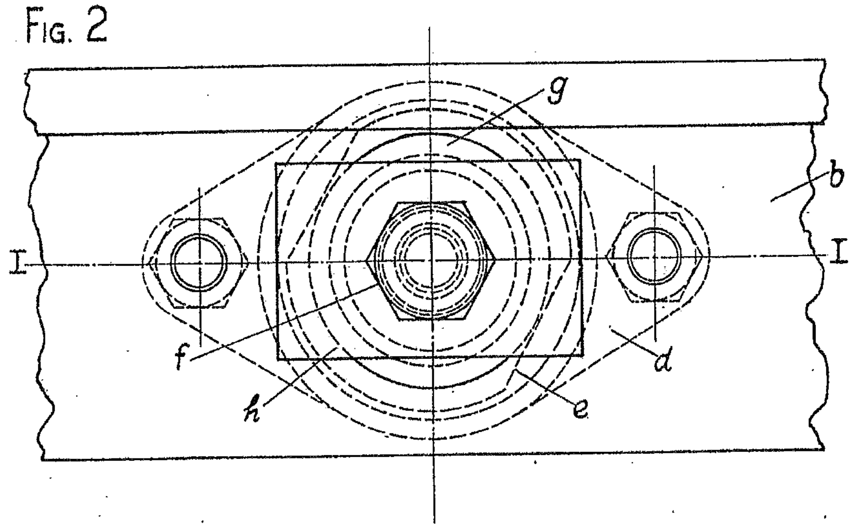


Fig. 2



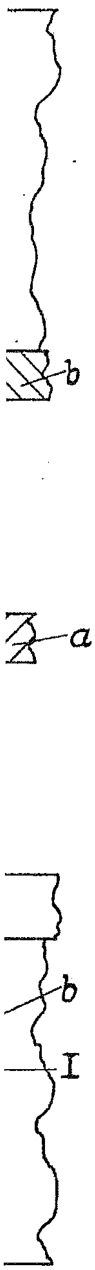


FIG. 3

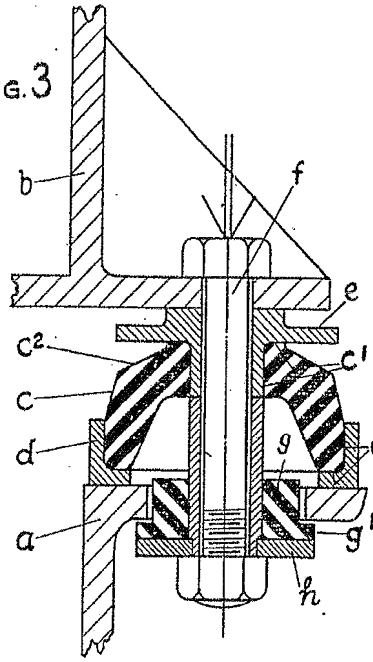


FIG. 4

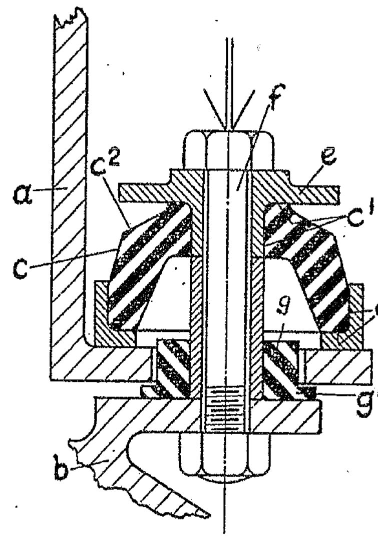


FIG. 5

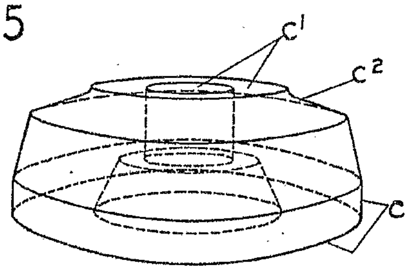
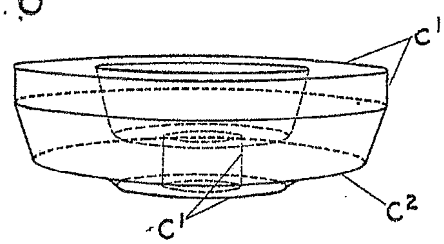


FIG. 6



SHEET 1

4 SHEETS
SHEET 2

Fig. 1

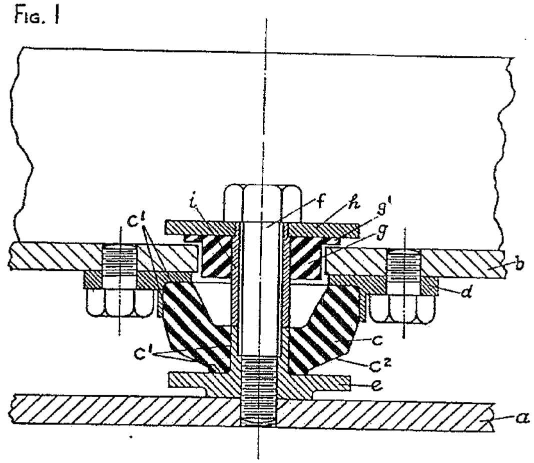


Fig. 2

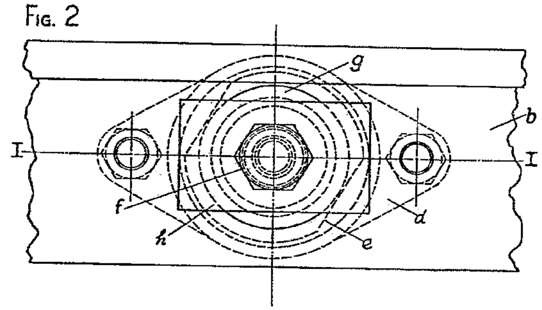


Fig. 3

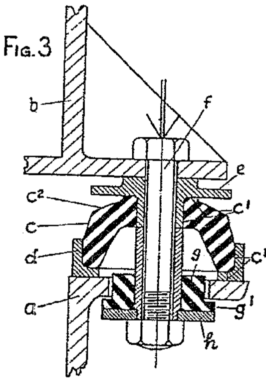


Fig. 4

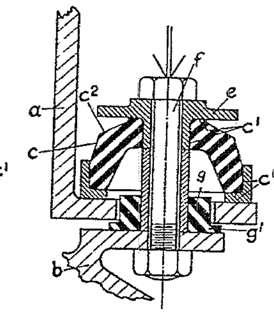


Fig. 5

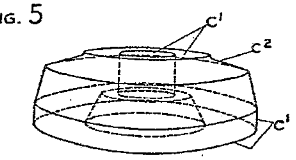
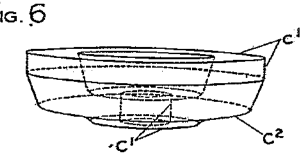


Fig. 6



[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 7

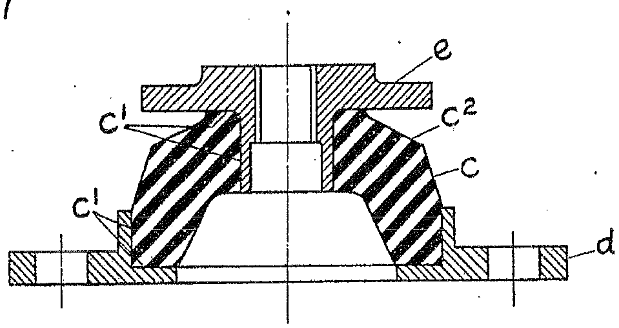


Fig. 8

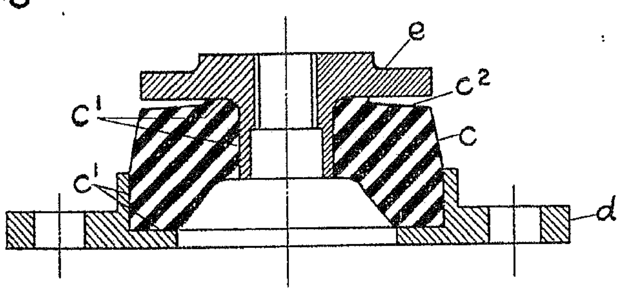


Fig. 9

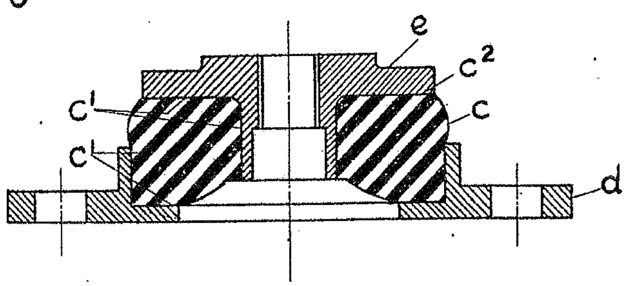


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Fig.

FIG. 10

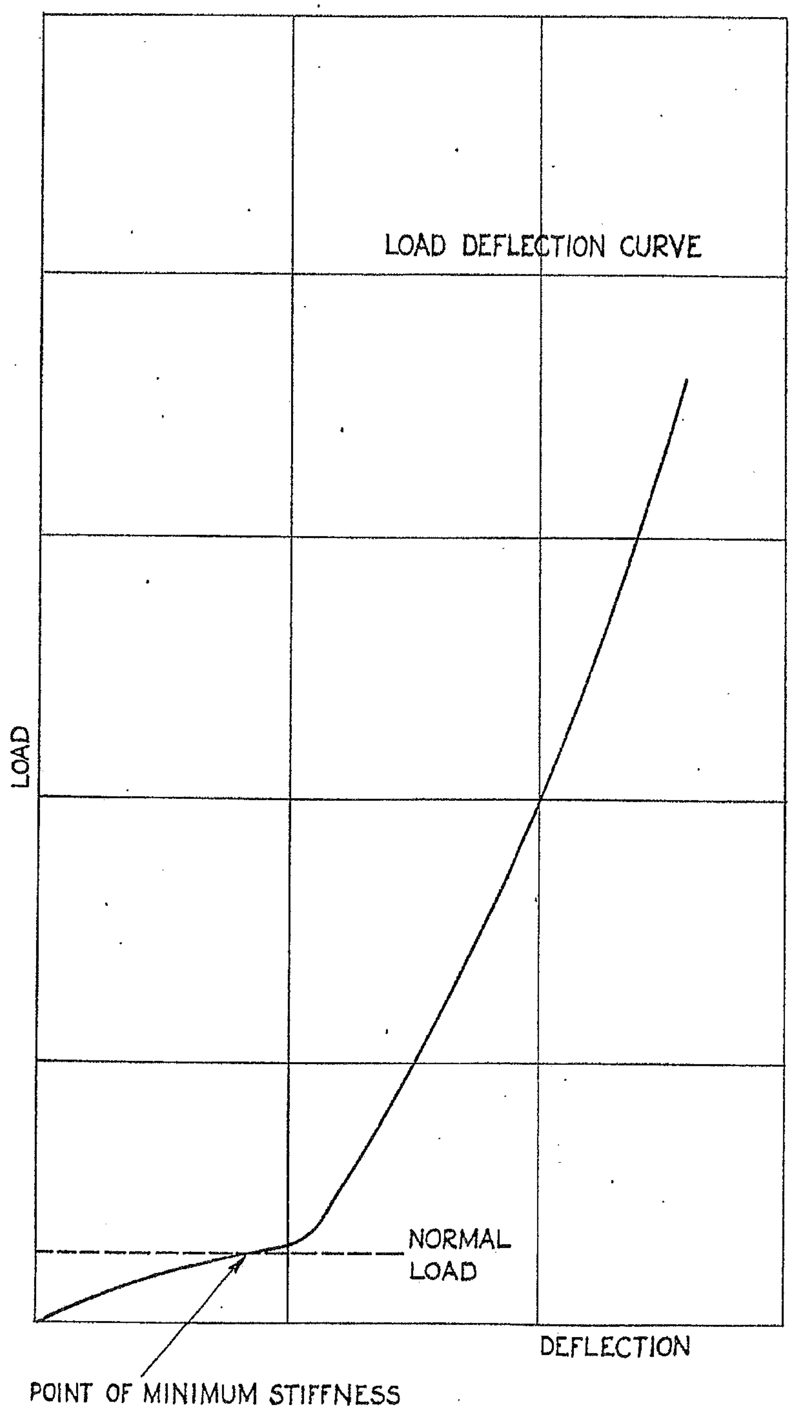
LOAD DEFLECTION CURVE
LOAD
NORMAL LOAD
DEFLECTION
POINT OF MINIMUM STIFFNESS

Fig. 7

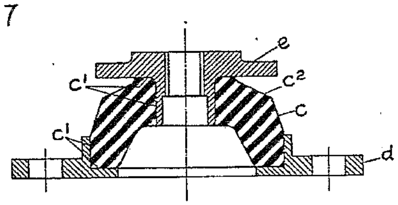

Fig. 8

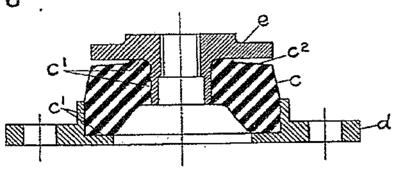

Fig. 9

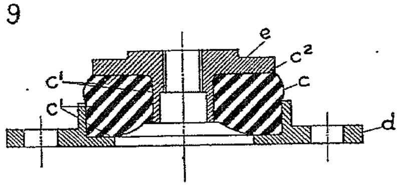

Fig. 10